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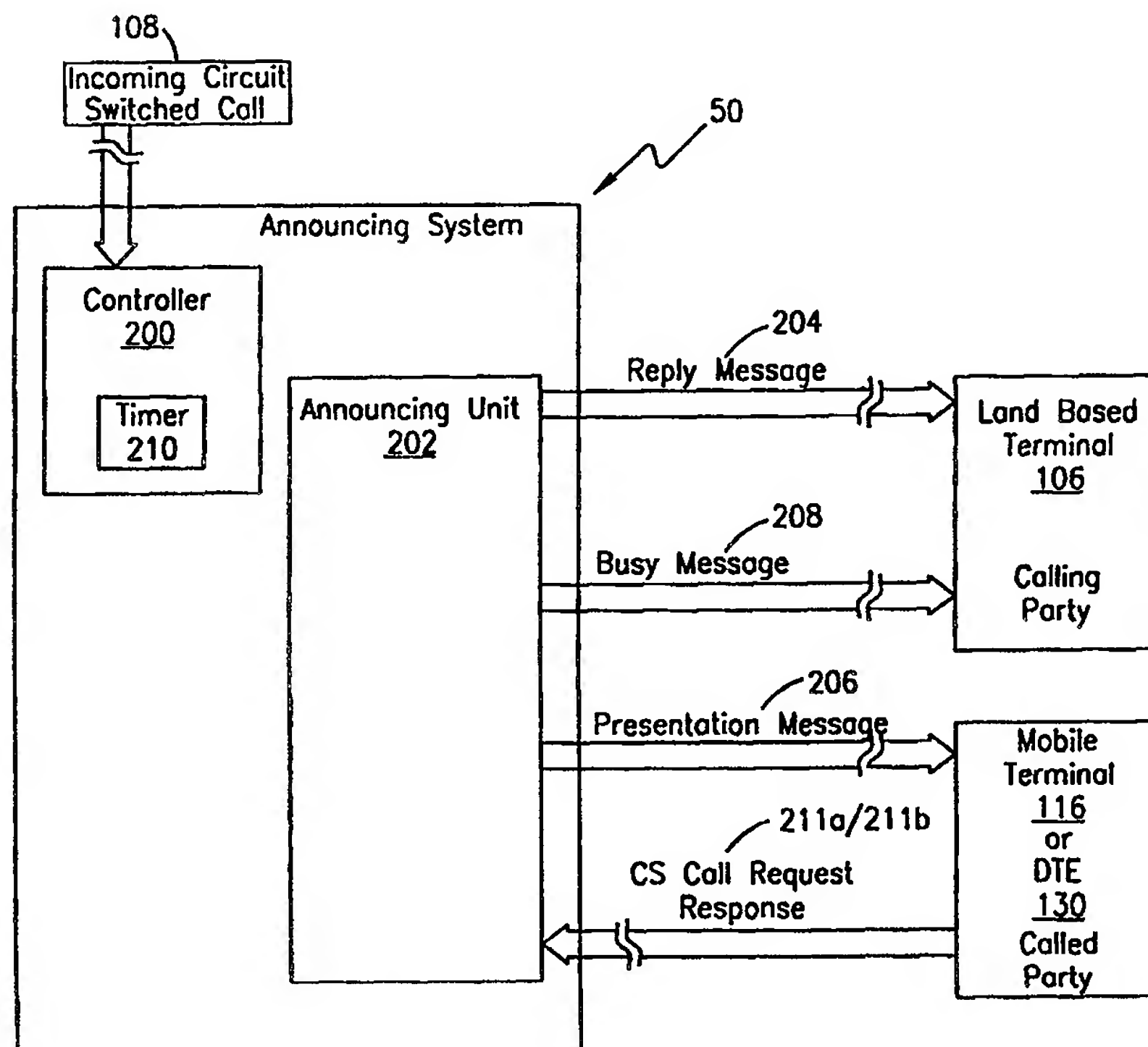
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(54) Title: AN ANNOUNCING SYSTEM AND METHOD USED IN A COMMUNICATIONS NETWORK FOR HOLDING INCOMING CIRCUIT SWITCHED CALLS

**(57) Abstract**

A communications network (100) having a method and announcing system (50) for holding an incoming circuit switched call (108) of a calling party (106) directed to a mobile terminal (116) currently operating in packet switched mode. The announcing system includes an announcing unit (202) for transmitting a reply message (204) to the calling party (106). The reply message (204) informs the calling party (106) that the mobile terminal (116) is busy and requests the calling party (106) to wait while the mobile terminal (116) is notified that the circuit switched call (108) has been received.



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**AN ANNOUNCING SYSTEM AND METHOD USED IN A  
COMMUNICATIONS NETWORK FOR HOLDING INCOMING CIRCUIT  
SWITCHED CALLS**

**CROSS REFERENCE TO RELATED APPLICATION**

This application is related to U.S. Patent Application filed on April 27, 1998  
entitled "A Communications Network and Method for Screening Incoming Circuit  
Switched Calls" (attorney's Docket No. 34646-408USPT) which is hereby  
5 incorporated by reference herein.

**BACKGROUND OF THE INVENTION**

Technical Field of the Invention

The present invention generally relates to the telecommunications field and, in  
particular, to an announcing system and method used in a communications network for  
10 holding an incoming circuit switched call directed to a mobile terminal currently  
operating in packet switched mode.

Description of Related Art

Some of the mobile terminals currently available to subscribers have the  
capability to communicate within a telecommunications network that supports both  
15 circuit switched communications and packet switched communications. The circuit  
switched communications include voice and data messages that occur in a circuit  
switched network incorporating, for example, the Public Switched Telephone Network  
(PSTN) and Integrated Services Digital Network (ISDN). Whereas, the packet  
switched communications include data applications that occur in a packet switched  
20 network incorporating, for example, the Internet.

Developers of telecommunication systems have predicted that packet switched  
communications will encompass a significant part of cellular traffic in the future.  
Consequently, a problem may occur more frequently where a subscriber using the  
mobile terminal for packet switched communications may not be aware that another  
25 party, (e.g., calling party) is trying to establish a connection for a circuit switched call.

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Operators of the telecommunication networks currently address the problem of the busy packet communications mobile terminal by providing a voice paging service. The voice paging service when active operates to notify the subscriber or called party whenever the calling party attempts to establish a circuit switched connection with the busy mobile terminal. However, when the voice paging service is not active then the circuit switched call is rejected and a busy tone is transmitted to the calling party.

A proposal addressing the problem has been submitted to the Japanese standards organization, which is responsible for maintaining and updating the Personal Digital Cellular (PDC) specification. The proposal discloses a new message that is generated and transmitted to the busy mobile terminal whenever the calling party attempts to establish a connection between the circuit switched call and the busy mobile terminal. The new message contains a phone number of the calling party. However, the calling party is not notified that the called party is currently communicating in packet switched mode and that there is a possibility that the connection for the circuit switched call will not be established.

Accordingly, there is a need for a method and system used in a telecommunications network for holding an incoming circuit switched call when a mobile terminal of a called party is operating in a packet switched mode. There is also a need of a system and method for informing the called party that the calling party is attempting to establish a circuit switched connection with the busy mobile terminal when the voice paging service is active. Additionally, a system and method are needed that transmits to the called party the phone number of the calling party trying to establish this circuit switched connection. These and other needs are satisfied by the announcing system and method of the present invention.

## SUMMARY OF THE INVENTION

The present invention is a method and announcing system used in a telecommunications network for holding an incoming circuit switched call of a calling party directed to a mobile terminal currently operating in packet switched mode. The announcing system includes an announcing unit for transmitting a reply message to the

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calling party. The reply message informs the calling party that the mobile terminal is busy and requests the calling party to wait while the mobile terminal is notified that the circuit switched call has been received.

5 In accordance with the present invention a method and announcing system are provided to hold an incoming circuit switched call whenever a mobile terminal is operating in packet switched mode.

Also in accordance with the present invention a method and announcing system are provided to inform a called party that a calling party is attempting to establish a circuit switched connection with a mobile terminal currently being used by the called  
10 party in packet switched mode when the voice paging service is active.

Further in accordance with the present invention a method and announcing system are provided that transmits to a called party the phone number of a calling party trying to establish a circuit switched connection.

Also in accordance with the present invention a method and announcing system  
15 are provided that will enable an operator of the telecommunications network to charge a called party and/or calling party for the services of the present invention.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

A more complete understanding of the method and apparatus of the present invention may be had by reference to the following detailed description when taken in  
20 conjunction with the accompanying drawings wherein:

FIGURE 1 is a diagram of a telecommunications network incorporating an exemplary announcing system in accordance with the present invention;

FIGURE 2 is a block diagram illustrating in greater detail the announcing system shown in FIGURE 1; and

25 FIGURE 3 is a signal sequence chart illustrating an operation of the announcing system shown in FIGURES 1 and 2.

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**DETAILED DESCRIPTION OF THE DRAWINGS**

Referring to the Drawings, wherein like numerals represent like parts throughout FIGURES 1-3, there is disclosed an exemplary announcing system 50, which can be used to implement a preferred embodiment of the present invention.

5           Although a communications network 100 embodying the announcing system 50 of the present invention will be discussed based on the Personal Digital Cellular System (PDC) specification, it should be understood that the PDC specification is only one of many specifications and standards that may utilize the principles of the present invention. Accordingly, the announcing system 50 described should not be construed  
10           in such a limited manner.

Referring to FIGURE 1, there is illustrated a diagram of the communications network 100 incorporating the exemplary announcing system 50. Excluding the announcing system 50, the general architecture of the communications network 100 is well known and includes a packet switched network 102 and a circuit switched  
15           network 104.

The circuit switched network 104 includes a land-based terminal 106 (e.g., fixed terminal, PSTN/ISDN telephone) used by a calling party to initiate a circuit switched call 108, which is transmitted through a network 110 (e.g., PSTN/ISDN) to a gateway mobile services switching center (GMSC) 112. The GMSC 112 interrogates  
20           a home location register (HLR) 114 to determine if a mobile terminal 116 is in packet switched mode (e.g., data messages) or circuit switched mode (e.g., voice messages). The HLR 114 is common to both the packet switched network 102 and the circuit switched network 104. Of course, the mobile terminal 116 utilizes the packet switched network 102 while operating in packet switched mode and the circuit switched network  
25           104 while operating in circuit switched mode.

The HLR 114 in addition to knowing whether the mobile terminal 116 is operating in packet or circuit switched mode also maintains subscription data and keeps track of the location or VMSC service area where the mobile terminal currently resides. The HLR 114 is able to keep track of the current location of the mobile terminal 116,  
30           because as the mobile terminal travels into a geographic area served by a particular



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radio network 118 it registers with a visited mobile services switching center (VMSC) 120 or a visited packet mobile services switching center (VPMSC) 128 that informs the HLR of the mobile terminal's current location. There may be multiple VMSC's 120 located in the circuit switched network 102, where all of the VMSCs would communicate with the GMSC 112. The VMSC 120 preferably houses the announcing system 50.

The packet switched network 102 includes an Internet host 122 (e.g., fixed terminal) capable of communicating with the mobile terminal 116 through an Internet network 124. The Internet network 124 connects to a gateway packet mobile services switching center (GPMSC) 126 that communicates with the HLR 114. The GPMSC 126 also connects to the VPMSC 128, where the GPMSC and VPMSC are similar to the GMSC 112 and VMSC 120 of the circuit switched network 104. There may also be multiple VPMSCs 128 located within the packet switched network 104.

The mobile terminal 116 typically communicates with a data terminal equipment (DTE) 130 to allow packet data communication. Alternatively, the mobile terminal 116 may incorporate the DTE 130 instead of connecting to the DTE (as shown). In either case, the DTE 130 is assigned a permanent address or dynamic address. This address is known as an Internet Protocol (IP) address.

For purposes of clarity, a detailed discussion of the conventional components (e.g., HLR 114, VMSC 120, GPMSC 126) forming the communications network 100 has not been provided. It should also be understood that the announcing system 50 may stand alone (as described) or be housed anywhere within the communications network 100.

Referring to FIGURE 2, there is illustrated a block diagram of the exemplary announcing system 50. The announcing system 50 may be implemented by either software, hardware, or a combination of software and hardware. The hardware implementation is discussed herein.

The announcing system 50 is triggered when the mobile terminal 116 and DTE 130 are connected to the Internet host 122 (e.g., packet switched mode) when the calling party attempts to establish a connection for the circuit switched call 108 with the busy mobile terminal.

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In such a situation, a controller 200 of the announcing system 50 receives the circuit switched call 108 from the GMSC 112 (FIGURE 1). The controller 200 is coupled to an announcing unit 202 that transmits a reply message 204 to the land based terminal 106 or calling party when the controller 200 receives the circuit switched call 108. In another embodiment of the present invention, the controller 200 may be located in the VMSC 120 (FIGURE 1) instead of the announcing system 50.

The reply message 204 (e.g., digital voice, text) informs the calling party that the mobile terminal 116 and called party (e.g., subscriber) are currently communicating in packet switched mode, with, for example, the Internet host 122. The reply message 204 also requests the calling party to wait while the called party and mobile terminal 116 are notified that the calling party is trying to establish a circuit switched connection. In effect, the reply message 204 informs the calling party that the mobile terminal 116 is busy and that the called party may answer in the near future.

The announcing unit 202 further generates and initiates a presentation message 206 (e.g., digital voice, text) to inform the called party that the calling party via the circuit switched call 108 is attempting to establish a connection with the mobile terminal 116. The presentation message 206 is transmitted on a packet channel of the packet switched network 102. The presentation message 206 can also include a phone number of the calling party. The called party may refer to the phone number in the presentation message 206 to determine whether or not to accept the circuit switched call 108.

If the called party accepts the circuit switched call 108, then the current packet switched communication is disconnected and the circuit switched call is connected. The called party can accept the circuit switched call 108 in several ways including, for example, by depressing a button or by saying a particular word(s). The called party may also accept the circuit switched call 108 or return a call to the calling party after completing the packet switched communications. Otherwise, if the called party rejects the circuit switched call 108 then the announcing unit 202 generates and transmits a busy message 208 to the calling party.

A timer 210 can be used to inform the controller 200 to reject the circuit switched call 108 if the called party does not accept or reject the circuit switched call



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within a predetermined amount of time. The called party or operator of the communications network 100 determines the duration of the predetermined amount of time that is first measured from the time the controller 200 receives the circuit switched call 108. The busy message 208 may be sent to the calling party if the predetermined amount of time has passed. It should be understood, that the announcing system 50 is capable of supporting multiple mobile terminals 116 and multiple incoming circuit switched calls 108 at any given time, however, for clarity, only one mobile terminal and circuit switched call 108 are discussed. The various messages and steps to implement the announcing system 50 will be discussed in detail with reference to FIGURE 3.

Referring to FIGURE 3, there is illustrated a signal sequence chart showing the events occurring between the time the circuit switched call 108 is initiated through the time the incoming circuit switched call is connected, if at all. As discussed earlier, the operation of the announcing system 50 may be performed within either the packet switched network 102 or the circuit switched network 104 of the communications network 100 based on the PDC specification. However, other specifications or standards may be used that incorporate both the packet switched network 102 and the circuit switched network 104 such as, for example, the Digital-Advanced Mobile Phone System (D-AMPS) and the Global System for Mobile Communications (GSM) System.

Figure 3 illustrates the signaling that occurs between the announcing system 50, land based terminal 106, GMSC 112, HLR 114, VMSC 120, VPMSC 128, and the mobile terminal 116 or DTE 130; of course, the arrows indicate the direction of the communications. The called party transmits the circuit switched call 108 as an initial address message (IAM) 300 from the land based terminal 106 towards the GMSC 112. Upon receiving the IAM 300, the GMSC 112 forwards a Terminating Call Routing Retrieval (TCRR) signal 302 to the HLR 114. In response to receiving the signal 302, the HLR 114 generates and transmits a TCRR reply signal 304 back to the GMSC 112. The TCRR reply signal 304 indicates whether the mobile terminal 116 is in packet switched mode or circuit switched mode. The IAM 300 or circuit switched call 108 is routed to the controller 200 via the VMSC 120, when the TCRR reply signal 304 indicates that the mobile terminal 116 is currently communicating in packet switched mode.

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The announcing system 50 and, more specifically, the announcing unit 202 then generates and transmits the reply message 204 to the calling party located at the land based terminal 106. The reply message 204 informs the calling party that the mobile terminal 116 is busy and that the called party may answer in the near future.

5           The announcing unit 202 further generates and transmits the presentation message or CS call request message 206 to the VMSC 120, which then transmits the CS call request message (e.g., A number) to the VPMSC 128. Thereafter, the VPMSC 128 transmits the CS call request message 206 on the packet channel to the DTE 130 and the mobile terminal 116. The CS call request signal 206 may include the phone  
10           number of the calling party, and can be a modified "UPCH Voice Paging" message referenced in the PDC specification.

          In response to the CS call request message 206, the called party at the mobile terminal 116 and the DTE 130 can accept or reject the circuit switched call 108. If the called party rejects the circuit switched call 108 by affirmative action (e.g., depressing  
15           a button) or nonaction (e.g., passing of a predetermined amount of time) then a CS call request response 211a set for reject is transmitted via the VPMSC 128 through the VMSC 120 to the announcing system 50. The announcing unit 202 then transmits the busy message 208 to the calling party. Alternatively, the announcing unit 202 could reroute the circuit switched call 108 to a voice mail service, or forward the circuit  
20           switched call to another phone number instead of transmitting the busy message 208 when the called party rejects the circuit switched call.

          Otherwise, if the called party accepts the circuit switched call 108 then a CS call request response 211b set for accept is transmitted via the VPMSC 128 through the VMSC 120 to the announcing system 50. In response to the CS call request response  
25           (accept) 211b, the VPMSC 128 operates to disconnect the current packet switched communication and the VMSC 120 operates to connect the circuit switched call 108. The CS call request response 211a (reject) and 211b (accept) can be a "UPCH Voice Paging Response" message referenced in the PDC specification.

          It should also be noted that the CS call request response 211a (reject) and CS  
30           call request response 211b (accept) between the VMSC 120 and VPMSC (128), and

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between the VPMSC 128 and MS116/DTE 130 may be functionally the same but not physically the same message.

Furthermore, the CS call request responses 211a and 211b may not need to be sent to the announcement system 50. The mobile terminal 116 could send a  
5 terminating condition report on a CCH channel after packet disconnection. The CCH channel, described in the PDC standard, sends the terminating condition report (TCRR) signal used by an idle mobile station as a response to a paging signal for a circuit switched call from the network.

From the foregoing, it can be readily appreciated by those skilled in the art that  
10 the present invention provides a method and system for holding an incoming circuit switched call when a mobile terminal of a called party is operating in packet switched mode. Also, the system as disclosed may be used to transmit to the called party a phone number of the calling party. Furthermore, the disclosed system may enable an operator of the communications network to charge the called party or the calling party  
15 for the services of the present invention.

Although one embodiment of the method and apparatus of the present invention has been illustrated in the accompanying Drawings and described in the foregoing Detailed Description, it will be understood that the invention is not limited to the embodiment disclosed, but is capable of numerous rearrangements, modifications and  
20 substitutions.

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**WHAT IS CLAIMED IS:**

1. An announcing system used in a communications network and enabled whenever a calling party attempts to establish a connection for a circuit switched call with a called party using a mobile terminal operating in packet switched mode, said  
5 announcing system comprising:  
an announcing unit for transmitting a reply message informing the calling party that the mobile terminal is busy and requesting the calling party to wait while the mobile terminal is notified of the circuit switched call.
- 10 2. The announcing system of Claim 1, wherein said announcing unit further initiates a presentation message for informing the called party that the controller received the circuit switched call, said presentation message is transmitted on a packet channel.
- 15 3. The announcing system of Claim 2, wherein the presentation message includes a phone number of the calling party.
4. The announcing system of Claim 2, further comprising a controller coupled to the announcing unit for receiving and holding the circuit switched call.
- 20 5. The announcing system of Claim 4, wherein said controller includes means for connecting the circuit switched call to the mobile terminal when the called party responsive to the presentation message accepts the circuit switched call.
6. The announcing system of Claim 4, wherein said controller includes a timer for determining when a predetermined amount of time has elapsed since receiving the circuit switched call.

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7. The announcing system of Claim 6, wherein said announcing unit further transmits a busy message to the calling party when the predetermined amount of time has elapsed and the called party has not accepted the circuit switched call.

5 8. The announcing system of Claim 1, wherein said announcing unit further transmits a busy message to the calling party when the called party rejects the circuit switched call.

9. The announcing system of Claim 4, wherein said controller further reroutes the circuit switched call to a voice mail service when the called party rejects the circuit switched call.

10 10. The announcing system of Claim 4, wherein said controller further forwards the circuit switched call to another phone number when the called party rejects the circuit switched call.

11. A communications network comprising:  
15 a packet switched network;  
a circuit switched network coupled to the packet switched network;  
a mobile terminal of a called party capable of communicating with either the packet switched network or the circuit switched network; and

an announcing system coupled with the circuit switched network, said  
20 announcing system for holding an incoming circuit switched call of a calling party directed to the mobile terminal currently operating in packet switched mode, said announcing system including:

an announcing unit for transmitting a reply message informing  
the calling party that the mobile terminal is busy and requesting the calling party  
25 to wait while the mobile terminal is notified of the received circuit switched call.



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12. The communications network of Claim 11, further comprising a data terminal equipment coupled to the mobile terminal.

13. The communications network of Claim 11, wherein said announcing unit further initiates a presentation message for informing the called party that the controller  
5 received the circuit switched call, said presentation message includes a phone number of the calling party.

14. The communications network of Claim 11, wherein said announcing system or a visiting mobile services switching center further includes a controller for controlling the circuit switched call.  
10

15. The communications network of Claim 14, wherein said controller includes means for connecting the circuit switched call to the mobile terminal when the called party responsive to the presentation message accepts the circuit switched call.

16. The communications network of Claim 14, wherein said controller includes a timer for determining when a predetermined amount of time has elapsed since receiving the circuit switched call.  
15

17. The communications network of Claim 16, wherein said announcing unit further transmits a busy message to the calling party when the predetermined amount  
20 of time has elapsed and the called party has not accepted the circuit switched call.

18. In a communications network including a packet switched network connected to a circuit switched network and an announcing system connected to the circuit switched network, said method comprising the steps of:  
25 rerouting a circuit switched call directed to a mobile terminal of a called party from the circuit switched network to the announcing system when the mobile terminal is operating in packet switched mode;

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informing a calling party initiating the circuit switched call that the mobile terminal is busy; and

requesting the calling party to wait while the mobile terminal is notified that the announcing system is holding the circuit switched call.

5

19. The method of Claim 18, further comprising the step of informing the called party that the announcing system is holding the circuit switched call.

20. The method of Claim 19, wherein the step of informing includes transmitting to the called party a phone number of the calling party.

10 21. The method of Claim 20, further comprising the steps of determining whether the called party accepted the circuit switched call.

22. The method of Claim 21, wherein the step of determining further includes the steps of:

15 disconnecting a packet switched call when the called party accepts the circuit switched call; and

connecting the circuit switched call between the calling party and the called party.

20 23. The method of Claim 22, wherein the step of connecting further includes transferring the circuit switched call from the announcing system to the called party, and releasing the announcing system.

24. The method of Claim 23, wherein the step of determining further includes notifying the calling party when the called party rejected the circuit switched call.

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25. The method of Claim 19, wherein the step of informing includes calculating when a predetermined amount of time has elapsed since the announcing system received the circuit switched call.

5 26. The method of Claim 25, wherein the step of calculating includes transmitting a busy message to the calling party when a predetermined amount of time has elapsed and the called party has not accepted the circuit switched call.

27. The method of Claim 24, wherein the step of notifying includes transmitting a busy message.

10 28. The method of Claim 18, further comprising the step of forwarding the circuit switched call to another phone number when the called party rejects the circuit switched call.

29. The method of Claim 18, further comprising the step of rerouting the circuit switched call to a voice mail service when the called party rejects the circuit switched call.

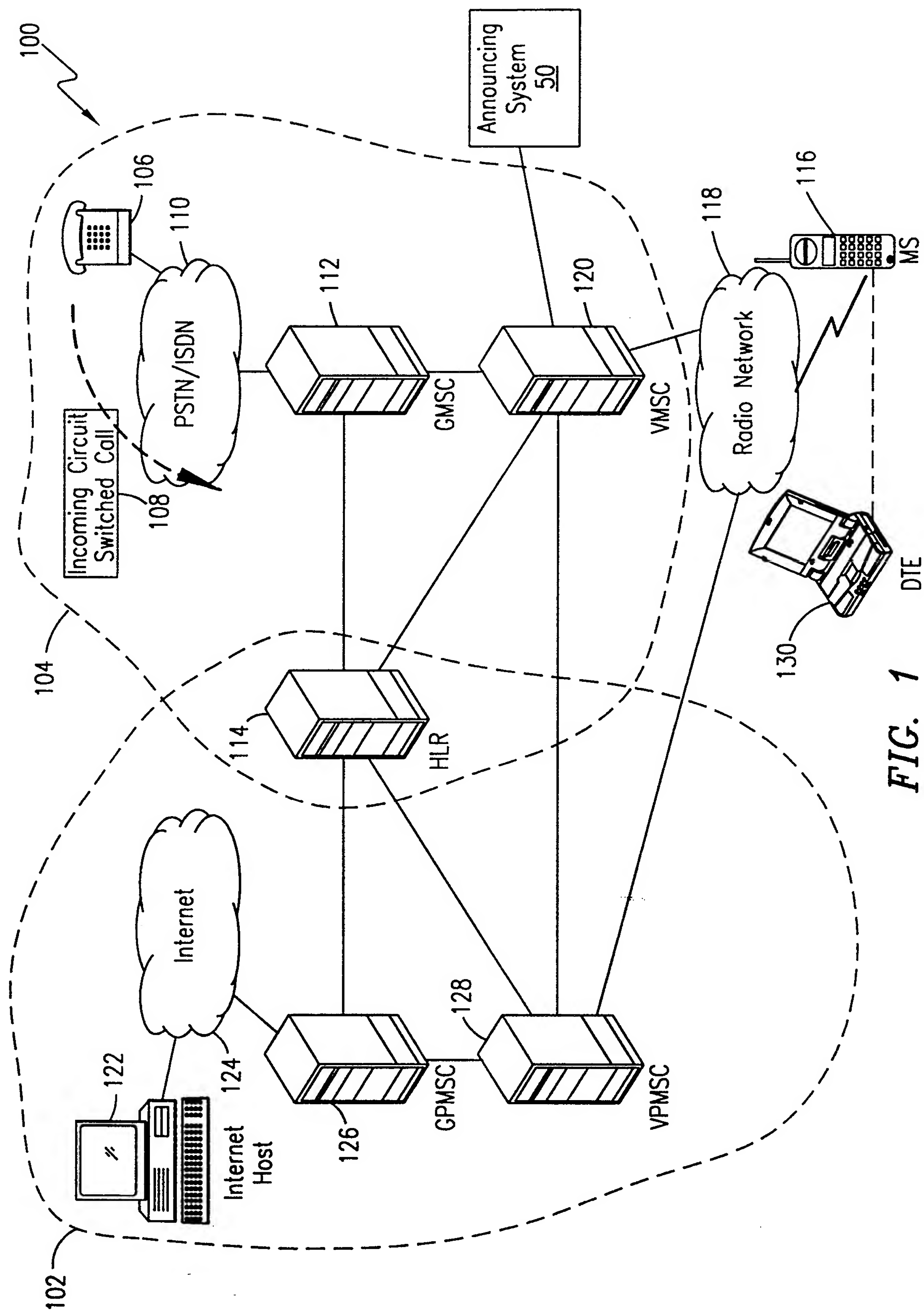


FIG. 1

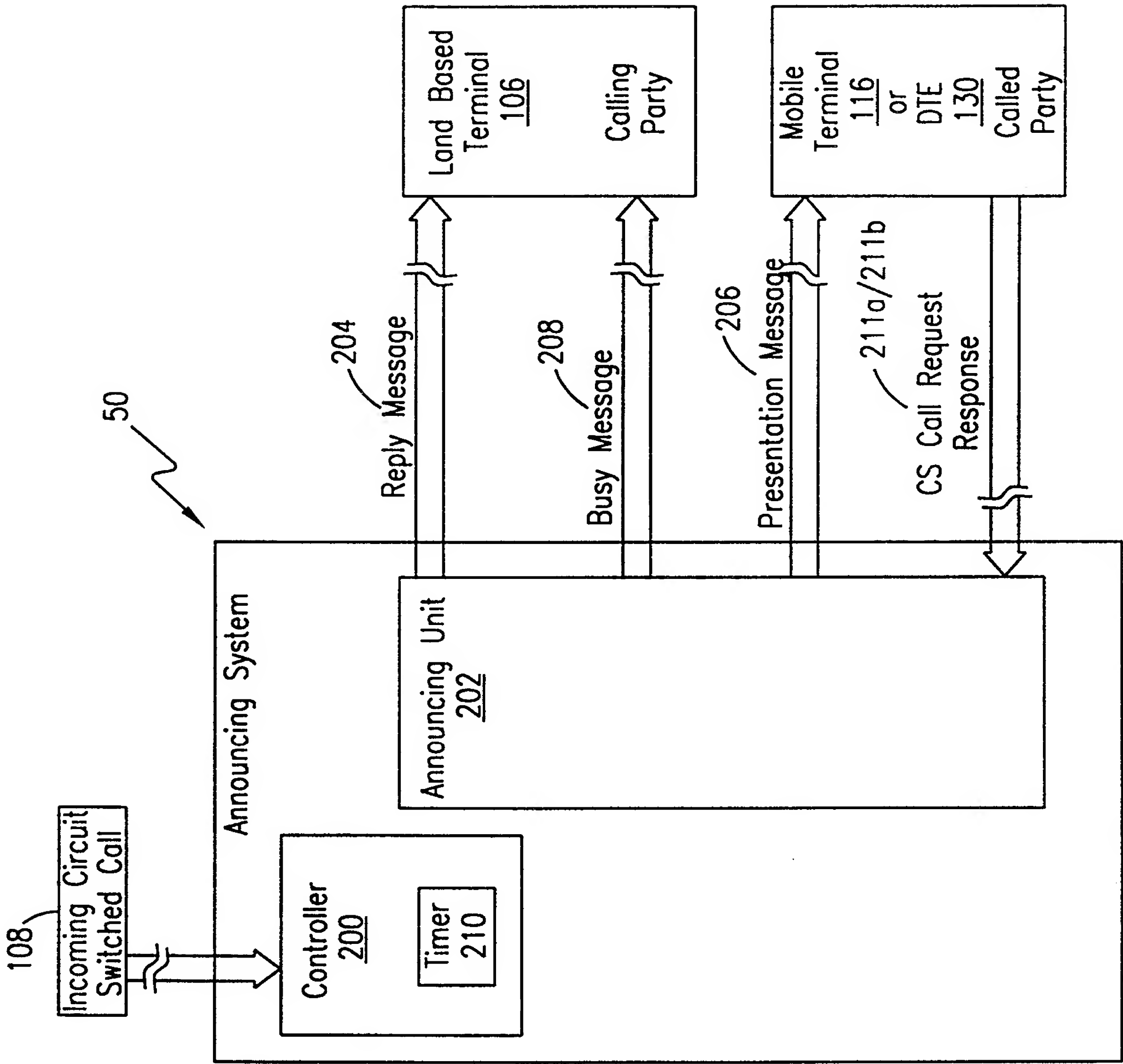


FIG. 2



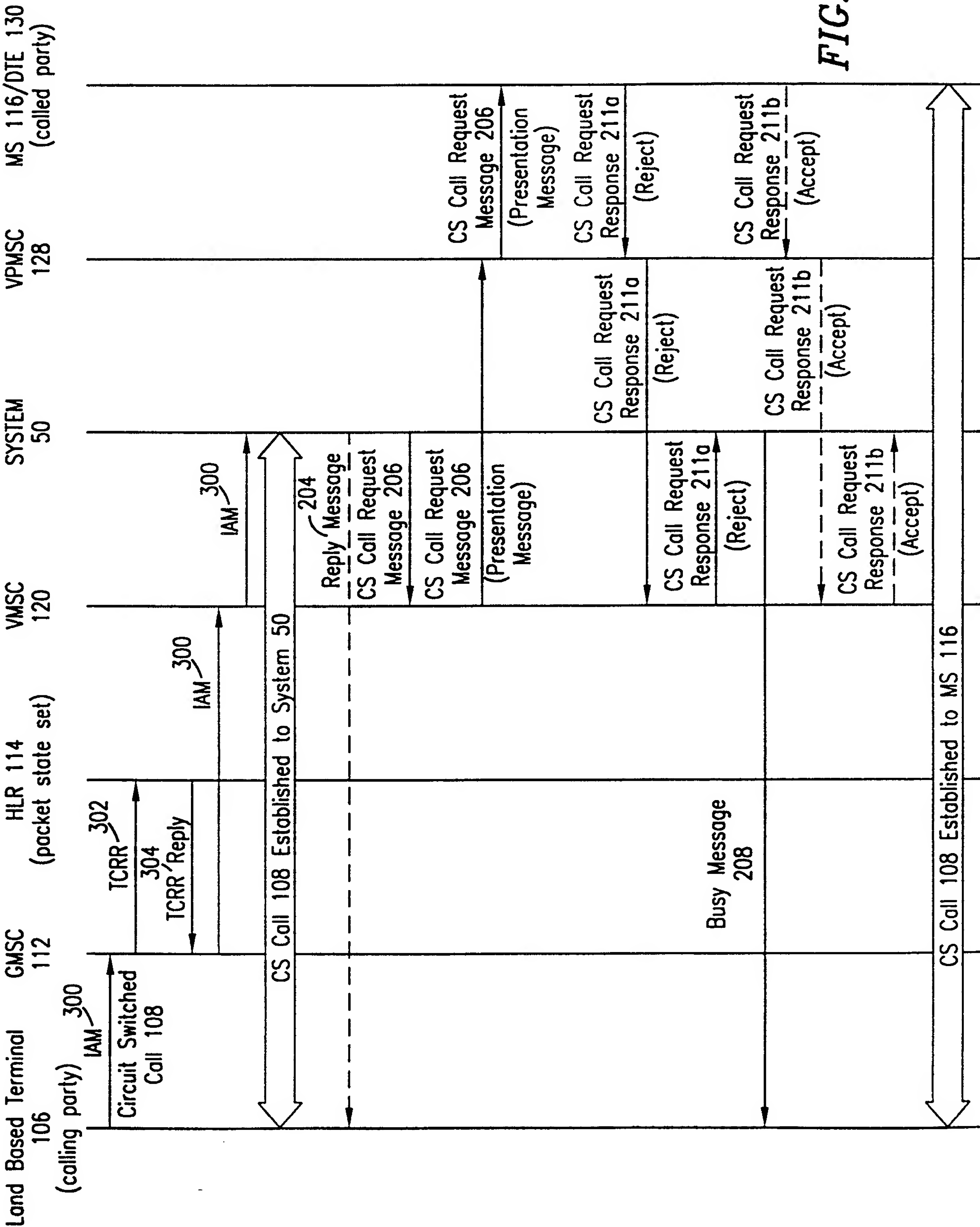


FIG. 3

# INTERNATIONAL SEARCH REPORT

national Application No

PCT/SE 99/00632

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 H04Q7/22

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 97 26764 A (NOKIA TELECOMMUNICATIONS OY ;KARI HANNU H (FI); HUOTARI SEPPÖ (FI)) 24 July 1997 (1997-07-24) page 7, line 30 - page 8, line 14; claims 1,4-7,11 ---	1,2,5, 11-13, 18,22
A	US 5 666 364 A (PIERCE JENNIFER A ET AL) 9 September 1997 (1997-09-09)  column 4, line 59 - column 5, line 8 column 1, line 54 - column 2, line 25 ---	1,2,8, 11-13, 18,22,24
A	US 5 701 297 A (CSAPO ET AL) 23 December 1997 (1997-12-23) cited in the application the whole document --- -/--	1,5,11, 15,18, 21,22



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Date of the actual completion of the international search

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# INTERNATIONAL SEARCH REPORT

national Application No  
PCT/SE 99/00632

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